UiT The Arctic University of Norway

Faculty of Science and Technology

Managing the Transition Towards Zero-Emission Aviation

A Grounded Theory Approach to Change Management

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Summary

The planet is facing the prospect of irreversible climate change, and aviation is expected to contribute to a future zero-emission society. The Norwegian government, technical developers and aviation industry deem Norway as a suitable arena for developing, testing, and implementing zero-emission aviation technology. The transition towards zero-emission aviation is comparable in magnitude to the shift from propeller powered aircraft to jet powered aircraft. What distinguishes these transitional processes is that one was technologically motivated, while the other is politically motivated through multilateral climate agreements, and the zero-emission technology is not developed yet. The number of stakeholders, lack of technologically developed solutions and expectations of safety from the travelling public and professional communities make this transition inherently complex. Therefore, the aim of this thesis is to attempt to answer the research question: "*What methods or approaches can best be used to manage the changes associated with the transition to zero-emission aviation?"*

The question is thought answered through qualitative method, specifically a Grounded Theory Method. A literature search and review deemed the change management theory as insufficient for answering the research question and utilizing Grounded Theory Method allowed for a bottom-up analysis rooted in data to analyse the transitional intricacies. The data capture method was semi-structured explorative interviews with seven pilots. The analysis was conducted by way of Strauss' coding paradigm and Ash' general model of social action.

The main findings are that the transition is highly dependent on trust, both amongst the change instigators and agents, as well as in the latent conditions influencing the transition. While no conclusion as to what method or approach can best be used to manage the transition is reached, the applied methodology is an attempt at disassociating with unsubstantiated assumptions found in change management literature, which may lead the way for further research into planning for highly complex transitional processes in unique contextual landscapes.

Preface

This thesis is the culmination of a Master's degree in Aviation Science.

Conducting research is hard. Conducting research is even harder when choosing a topic one is not studied in, accompanied by a methodological approach one is untrained in. In the natural sciences, two negatives become a positive. In social science, they do not. While the learning curve has been steep and the time short, this endeavour has probably taught me more about perseverance and hard work than it has about conducting research. And I did learn a lot about conducting research. To Wenche Navarsete and Widerøes Flyveselskap. Thank you for letting me interview your pilots. I hope you find some contributions to the process in this thesis. Thanks also to the interview participants who took time out of their busy schedules to contribute. To my friends and family who helped throughout this process with everything and anything from proofreading to babysitting. Your contributions may seem small, but this thesis could not have been finished without your help.

To my supervisor Lieutenant Commander BA MPhil PhD Royal Navy (ret.) John Ash. I sincerely thank you for going above and beyond your call of duty in helping a novice researcher finishing his thesis. It could not have been done without you. If your retirement serves you half as well as you served me, all days will be sunny hereon forward.

My dearest Elise. Thanks for your unwavering support, no matter the circumstances over the past three years. We have gone through being laid off from our jobs, starting new jobs, moving apartments, and becoming parents, with 3/4 of those changes happening within the last year – and coinciding with writing this thesis. The completion of this thesis is even more thanks to your contributions and sacrifice than mine.

Oslo, 31.08.2023

Stener Berg Nelson

1 Introduction

This section will present the background for the research topic and why it is important. It will describe the thesis theme and introduce the research question. The limitations and scope of the thesis will also be introduced.

1.1 Background

This thesis started on a basis of being interested in organizational change processes in aviation. Having been a professional pilot for five years and experienced two strikes, being laid-off due to the pandemic and not being rehired due to conflict between employer and employees, a fascination for organizational changes emerged. This fascination was not only aimed at the management perspective of managing or instigating change, but also at the recipient view of receiving, implementing, and experiencing change. The main interest in the management of change processes revolved around why there seemed to be an apparent gap between operative and administrative personnel in airlines.

From the previously mentioned lived experiences of being a change recipient, quite often a disbelief in the motives of the change was experienced by the recipients. Stanley et al. (2005) term this lack of belief in the managements stated change motives as change-specific cynicism. They also distinguish between change-specific cynicism and change-specific scepticism. While cynicism is correlated with a disbelief in change motives, change-specific scepticism is related to the belief in the organizations ability to implement the suggested changes. This led to suggested research questions such as “in what way did the processes of change in Airline 1 and Airline 2 adhere to theory on change management?” or “why are there apparent differences in the means to an end for operative and administrative personnel in airlines?” or research aimed more towards risk management in change processes such as “in what way does management have to consider dynamic risk management when managing changes in complex socio-technical systems?”.

Parallel to exploring these potential research questions, a literature search and review were conducted. An early discovery in the literature review was that there is no universal theory on change management (Buchanan, 2017; Burnes, 1996). One of the main assumptions on which a lot of change management processes, recipes and research built their entire foundation on was largely disproved through one research paper (Hughes, 2011). The literature search also proved the need for more theoretical evaluation and research on change processes in aviation

since there is little available literature on the subject, as seen by the number of relevant hits in Appendix A. Referring to the potential research questions in the previous paragraph, these all assumed that there was some form of universally accepted theory of change management. Discovering the theoretical discrepancies in literature also allowed a change in methodology for the thesis, from a hypothesis-testing method towards a theory generating method. It also opened for researching a change which lies in the future, rather than evaluating change processes of the past, which was what the change management related aviation literature had done[1].

This led to an idea of writing a thesis which focused on the transition towards zero-emission aviation. This is an industry-wide paradigm shift with a magnitude comparable probably only to the transition from piston-powered propulsion to jet engines. The main distinguishment between the two transitions is that the transition to jet engines was driven by technological progress and the desire to fly higher, faster, and longer. The change towards zero-emission technology is largely driven by political ambitions and multilateral climate agreements. As previously stated, change processes are inherently complex and there is no standardized formula with universal application to all situations. The complexity further increases with variables such as stakeholders with differing priorities, no developed aircraft or sustainable propulsion technology with the capabilities of its fossil driven counterparts, as well as the expectation of high safety levels from the general public and professional communities. This thesis will therefore suggest findings that may be of importance for ensuring the highest probability of a successful transition to zero-emission aviation.

There are numerous reports stating the transitional objectives and timeline. What these reports in large part fail to consider is the perspective of the hands-on operators of the future technology, and their potential input and contributions to the change process. Having previous experience as a pilot allows access to populations which may be largely unavailable to other researchers. Having lived with the population in an almost anthropological fashion also allows for the researcher to become an instrument of translation between important stakeholder groups. This thesis will therefore serve as a contribution to the overall transitional process by conveying the viewpoints of a stakeholder group which can highly influence the transitional success rate based on their degree of support. It does not merely serve as a gap-

[1] For exemplars, see; Bruch & Sattelberger, 2000 and Lofquist, 2011

filling contribution to some minute intricacies within management studies. This research contributes a bottom-up, data rooted analysis of a paradigm shift in aviation, and a practical contribution to a transition process which has already started. This is why this research is important.

1.2 Thesis theme

The planet is facing the prospect of irreversible climate change, and the aviation industry is expected to contribute in the effort to reach zero emissions. One of the Paris Agreements goals is reducing the impact of global warming by limiting the mean temperature increase to 1.5 degrees Celsius compared to pre-industrial times (1850 – 1900) by the end of this century (Meld. St. 10, (2022-2023), p.82; Meld. St. 13, (2020-2021), p.11). In addition, the signing countries also define Nationally Determined Contributions. The Norwegian NDC is to reduce emissions in 2030 by 40 percent compared to the emission levels in 1990, which was increased to 55 percent as part in the European Unions "Fit for 55" plan for a green transition (Regjeringen, 2021). If these goals are met, Norway will be a low emission country by 2050, and Norwegian aviation will be emission free by the same year (Meld. St. 13, (2020-2021), p.170).

Public Service Obligation (PSO) routes are aerial routes which are not economically viable for commercial operations but are serviced through regulated competition (Regulation 1008/2008). Norway is the country with the highest number of PSO routes in Europe, which in practice is a governmentally funded aerial infrastructure. The routes are procured through public tender processes to secure that the part of the population that lives rurally has access to a comparable level of welfare as those who live centrally, while also ensuring that the travel times are not disproportionally high (Avinor & Luftfartstilsynet, 2020; Meld. St. 10, (2022-2023), p. 52). Due to the high amount of PSO routes, Norway is considered as a highly suitable front-runner for the testing, incorporation, and operation of aerial zero-emission technology (Avinor & Luftfartstilsynet, 2020; Avinor et al., 2020; Meld. St. 10, (2022-2023), p. 97). Utilizing the public tender process to incentivize the use of climate friendly technology and solutions is one way of ensuring that the obligations made through the multilateral climate agreements are upheld (Meld. St. 10, (2022-2023), p. 98; Meld. St. 13, (2020-2021), pp. 61-62, 169; Meld. St. 20 (2020-2021), p. 67). The latest Invitation to Tender Procedure for Operation of scheduled regional air services in Norway has accounted for the integration

of these technologies when they become available (Norwegian Ministry of Transport, 2023, p. 13).

1.3 Research question

The transition of the transport sector is complex and requires a balance between the climatic obligations and a good transportation system for inhabitants and businesses (Meld. St. 13, (2020-2021), p.63). While the political ambitions when facing climate changes should be high due to the multilateral commitments, the geography, meteorology, and topography of Norway make the aerial PSO routes uniquely demanding from an operational perspective. Making sure that the balance between stakeholder interests and necessary trade-offs between political ambitions and safe operations are proportionate, is of critical importance to ensure the highest probability of a successful transition done in due time. Therefore, the aim of this thesis is to examine the transitional process from a change management perspective and attempt to suggest a suitable method or approach for the transition from fossil fuels to zero-emission technology. The research question is:

"*What methods or approaches can best be used to manage the changes associated with the transition to zero-emission aviation?"*

The question will be sought answered by way of Grounded Theory Method (GTM) and semi-structured interviews with pilots flying the PSO routes.

1.4 Thesis scope and limitations

The Norwegian Department of Transportation defines both zero-emission and low emission aircraft (Meld. St. 10, (2022-2023), p.88). This thesis is not concerned with the evolution of different technologies, but rather the management of change towards zero-emission technology. The definition of zero-emission aircraft is:

> A zero-emission aircraft is an aircraft with propulsion powered exclusively by zero-emission technology. Zero-emission technology is without direct CO2 emissions and includes the use of electric motors in combination with batteries, the use of fuel cells that applies carbon free energy carriers such as hydrogen, or the use of hydrogen in internal combustion engines, or a combination of these. (Meld. St. 10, (2022-2023), p.88).

The distinction between different types of zero-emission technologies is not a focal point in this thesis and the term zero-emission aircraft will therefore be used throughout the thesis. For the purpose of this paper, the term also encompasses any low emission technology as well as zero-emission technology. The thesis is also limited to considering direct emissions from aircraft propulsion technology and will not consider secondary emissions related to the development or production of the technology or life cycle related emissions.

During the writing of this thesis, Widerøe was purchased by Norwegian Air Shuttle (Hagmansen et al., 2023). Widerøe will continue to operate as a separate entity and subsidiary of Norwegian Air Shuttle. There may be consequences that influence Widerøes overall strategy with regards to zero-emission technology. The potential consequences and their effect on the transition to zero-emission technology will not be considered in this thesis, since it happened after data capture and analysis were conducted.

As will be further elaborated on in the methodology section, communication with Widerøe was conducted for recruitment of interview candidates. This thesis is however not commissioned by Widerøe or affiliated with Widerøe other than for recruitment of interview participants. Any and all findings are therefore privy to answering the research question and not subject to proprietary ownership of any external party.

2 Theoretical and empirical background

This section will present the theoretical and empirical background necessary for a contextualizing of the thesis. The theoretical background will revolve around change management theory and assumptions, as well as the transitional stakeholders. The empirical section will address aviation in Norway and what distinguishes operating aircraft in the Arctic.

2.1 Disassociating from the assumptions of change management

The chapter on theory is usually applied to present theoretical frameworks for analysing the research question. The theoretical chapter in this thesis will rather be utilized to explain why a disassociation with theoretical assumptions is necessary to produce research or knowledge which may be utilized in change management processes.

Management studies are caught in a pattern of gap-spotting research, intending to expand the knowledge of the field while only being mildly critical to the sources they use (Alvesson & Sandberg, 2013). As a result of this, organizational change studies are becoming irrelevant and obsolete if scholars and practitioners do not make active efforts to challenge this lack of progress (By, 2020). In the literature search and review for this thesis, much literature was found, but the literature either seemed too anecdotal (Kotter, 1995) or preoccupied with minute details which did not redeem much practical value to the study and performance of change management. After reviewing articles describing management studies as having lost their way (Alvesson & Sandberg, 2013), organizational change studies as being in a quagmire (By, 2020) and organizational change studies having lost their way (Hughes, 2022), the decision to disassociate with literature that built on potentially flawed or unfounded assumptions was made. This led to utilizing By (2020) illusions as guidelines on what not to do, and Hughes (2022) hopes as guidelines for what to do.

2.1.1 Illusions referred to as unequivocal facts.

The lack of critically assessing the accepted truths of the research field has led to illusions within change management, that are referred to as unequivocal facts (By, 2020), listed in Table 1.

Table 1: Illusions referred to as unequivocal facts

Illusion	Description
1	70% of all changes fail
2	We exist in a reality of managers versus employees
3	Successful organisational change is led by individual change agents – often being the managers
4	Change resistance among ‘employees’ is the cause of much change failure and as such must be better managed by managers
5	Continuous change is the only option
6	Leadership is something [formal] leaders do

2.1.2 Hopes for future organizational studies.

To assist in breaking the stagnation in change management studies, Hughes (2022) lists a number of hopes, or guidelines for future organizational studies, seen in Table 2. These hopes overlap with some of the illusions in table 1, and the implications of both the illusions and the hopes will be addressed in the next subsection.

Table 2: Hopes for future organizational studies

Hope	Description
1	Researchers should consider the history of change management in organizations
2	Acknowledge the complex mechanisms of organizational change and attempt to not generalize the findings in evaluation
3	Meaningful evaluation of organizational change will be a challenge, due to the complex and dynamic nature of change. It will therefore be hard to quantify when change is an accomplished event
4	Attempt to view change as something other than either successful or failed and embrace that every change process will have numerous successes and failures throughout.
5	Move focus towards developing change evaluation methodologies, rather than evaluating change on performance outcomes
6	Do not focus on finding evidence for change failures, since successes and failures are highly related to the context they are evaluated in
7	Question the assumption that change management fails, and change leadership succeeds

2.1.3 Reflections on illusions and hopes.

With regards to Illusion 1, the notion that change efforts fail at a quantified rate has largely been refuted (Hughes, 2011). Burnes (2010) questioned this assumption after reviewing practitioner and scholarly literature referring to change efforts failing between 60-90% of the times but found little empirical evidence of the claims. The claim of the 70% failure rate is

largely attributed to Beer & Nohria (2000). Hughes (2011, p. 456) dissected five instances referring to the claim and found no empirical evidence of a quantified change failure rate. Assuming a quantitative failure or success rate also fails to acknowledge the ambiguities of organizational change, the contextual dependency of change processes and the magnitude of perceived outcomes. This also coincides with Hughes (2022) hopes for future organizational studies. The reason for the perseverance of this illusion is that change management also is a service to be sold, and framing it as failing can be lucrative to those who sell it (Hughes, 2011).

Illusion 2 to 4 address the actors of change. Change management has traditionally been regarded through one of two lenses: that of the change agent or the change recipient (Armenakis & Harris, 2009). Change agents are practitioners, such as consultants or senior managers, and are responsible for the planning, developing, implementation and evaluation of organizational change (Phillips & Klein, 2023). The change agent perspective oftentimes maps out procedural steps or recipes for managers to adhere to such as Lewin's Three-Step Procedure (Lewin, 1997), Kotter's 8 step model (Kotter, 1995) and the Stace-Dunphy Contingency Model for Change Implementation (Dunphy & Stace, 1993). The complexity and nuances of change initiatives seem to render universal methods or standardized approaches suboptimal (Armenakis & Harris, 2009; Buchanan, 2017; Weiner, 2009).

Change recipients oftentimes are considered negative or reluctant to change, and therefore strategies to reduce resistance are introduced as managerial tools (Caldwell, 2013). The byproduct of an absence of change resistance or reluctance is a change environment where management enforces or instigates changes, and the change is successful only if the change recipients are passively accepting the intended changes (By et al., 2011). The distinction between change management and change managers has at times been negligible in practitioner literature, which in turn leads to the change agent being the catalyst for change (Armenakis & Harris, 2009; By et al., 2011; By, 2021). This inherently top-down change instigation tends to foster an environment where any questioning of the change rationale or method is considered resistance or opposition (Burnes et al., 2018). This can potentially lead to polarized environments between the change agents and change recipients and the differences in viewpoints can create oppositions (By, 2020). Rather than focusing on reducing resistance, researchers have suggested a focus on increasing change readiness, since a byproduct of increasing readiness is a reduction in change resistance (Caldwell, 2013). While

building encouragement for change is also that it may reduce resistance, while reducing resistance does not necessarily build readiness.

2.1.4 Theoretical guidelines for the thesis

The guidelines for this thesis will be to:

- Acknowledge the complex nature of change.
- Understand the contextual nature of the zero-emission transition.
- Not frame the transition as either failing or succeeding, through considering the many definitions of success or failure that are held by different stakeholders.
- Not assume that interventions or disagreements are resistance, but rather view them as contributions to the overall health of the transitional process.
- Attempt to find factors that build change readiness compared to strategizing to minimize resistance.

2.2 Transitional actors

For this thesis, the terms change instigators, change agents and change recipients will be used. The following section will define the terms as well as give a brief description of the transitional actors.

2.2.1 Change instigators

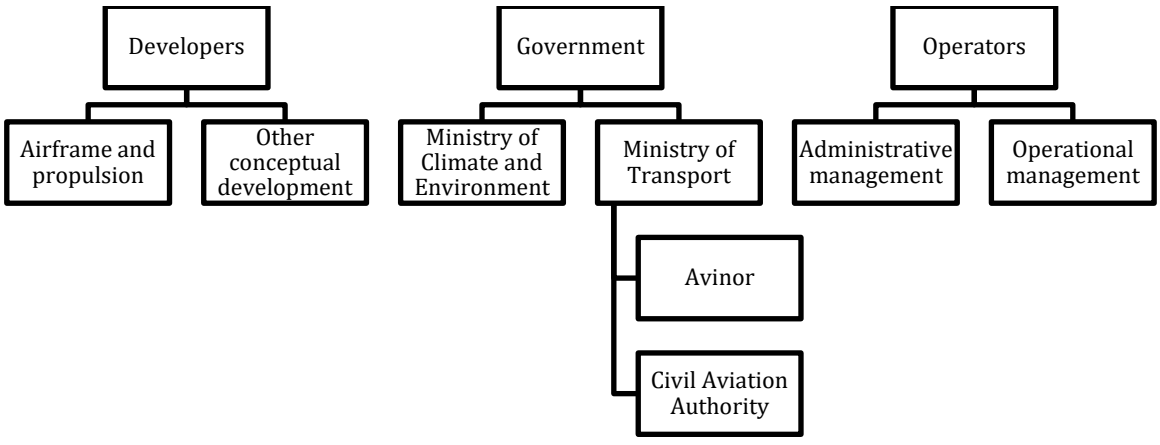

Figure 1: Change instigators

The drivers of change are technological, economic and political factors, often in combination (Buchanan, 2017; Whelan-Berry & Somerville, 2010). The term change instigator can be considered the actors asserting a form of influence on the change drivers. The governmental

institutions may influence the economic and political factors, while the developers and operators influence the technology.

The main change instigator is the government since the transition is rooted in environmental policy. The government has two Ministries that are concerned with this transition, the Ministry of Climate and Environment and the Ministry of Transport. While the Ministry of Climates role as a transitional stakeholder is through defining the National Climate Plan (Meld. St. 13 (2020-2021)), the ministry of Transport owns two of the main change instigators: Avinor and the Civil Aviation Authority. Avinor is a limited company and is responsible for 43 airports and has taken a leading role in the transition towards zero-emission aviation (Avinor, n.d.). The Civil Aviation Authority has the responsibility of overseeing and regulating all aspects of civil aviation in Norway (Luftfartsilsynet, n.d.).

The developers are companies developing airframe or propulsion technology, such as Eve Air or Rolls Royce, while the conceptual developers are companies like Widerøe Zero or constellations of contributors such as Green Aviation Norway. Widerøe Zero are an air mobility incubator which handles regulatory, commercial and financial aspects of zero-emission technology (Widerøe Zero, n.d.). Green Aviation Norway is a partnership between Avinor, Sintef, the Civil Aviation Authority and the Federation of Norwegian Industries which intends to contribute to the safe integration and certification of climate-friendly air transport (Green Aviation Norway, n.d).

The operators are airlines, such as SAS, Norwegian and Widerøe. They are the primary operators of the technology, and are separated into administrative and operational management. The reason for this is that within the same operating company, there may exist differing priorities between different branches of management. Administrative management may have a tendency to incline more towards commercial priorities, while operational management are tasked with flight operational leadership.

2.2.2 Change agents

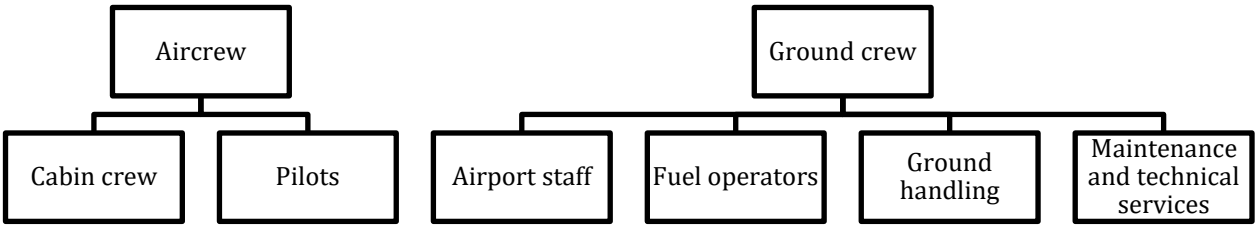

Figure 2: Change agents

The change agents are the actors tasked with implementing the associated transitional changes, namely being the hands-on operators of the new technology. The term change agent is used to illustrate a more active role in the process than if the group was termed change recipients.

Air crew consist of pilots and cabin crew, while ground crew are airport staff, fuel operators, ground handling and maintenance and technical services. Of the change agents, the pilots are probably considered the ones wielding the most influence in the transitional process, since they effectively can stop the transitional progress with reluctance to fly the new technology.

2.2.3 Change recipients

The actors in this transmission are all considered some form of change recipient, as they will have to experience the instigated and implemented changes as the transition progresses.

2.2.4 Aviation as part of the Norwegian infrastructure

Aviation is an important part of the Norwegian infrastructure. With a population of 5,5 million spread throughout the country's approximately 1790 kilometers from South to North, aviation becomes important both for business and leisure travel as well as securing the population that live non-centrally an approximately equal service offering as those who live centrally. Aviation is also a critical part of tourist activities in Norway and generates value through being an industry which directly and indirectly employs 60 000 people (Meld. St. 10 (2022-2023).

The Norwegian aviation sector contains regional, national, and international routes. The two largest operators, SAS and Norwegian Air Shuttle, operate medium-sized jets to larger airfields in Norway and to European destinations. SAS and Norwegian are each others main competition, and the main line market in Norway essentially serves as a duopoly. Widerøe is

the third largest airline in Norway. While Widerøe has diversified their operation to include jet operations after 70 years of operating exclusively propeller aircraft, it is not considered a direct competitor to Norwegian and SAS. This is because their activity in large part is based on flying to regional airports where SAS and Norwegian cannot operate with their airfcraft.

Most passengers will travel to regional centres with larger airports, such as Molde, Bodø or Tromsø with SAS or Norwegian and use Widerøe's services to smaller airports. Widerøe therefore becomes an important contributor in binding the more rural parts of Norway together with the larger regional centres and the capitol city of Oslo.

2.2.5 Public Service Obligation routes

While most of the Norwegian aviation industry is based on free market competition, some routes are not commercially viable. Norway has an extensive network of Public Service Obligation routes which ensure that those who live in rural areas of the country have equivalent access to capital city, university hospital and other extended health offerings not available in the region (Oslo Economics et al., 2022). Since these routes are procured through public tender contracts, they are not exposed to the same competitive framework as commercial operations in other Norwegian aviation segments.

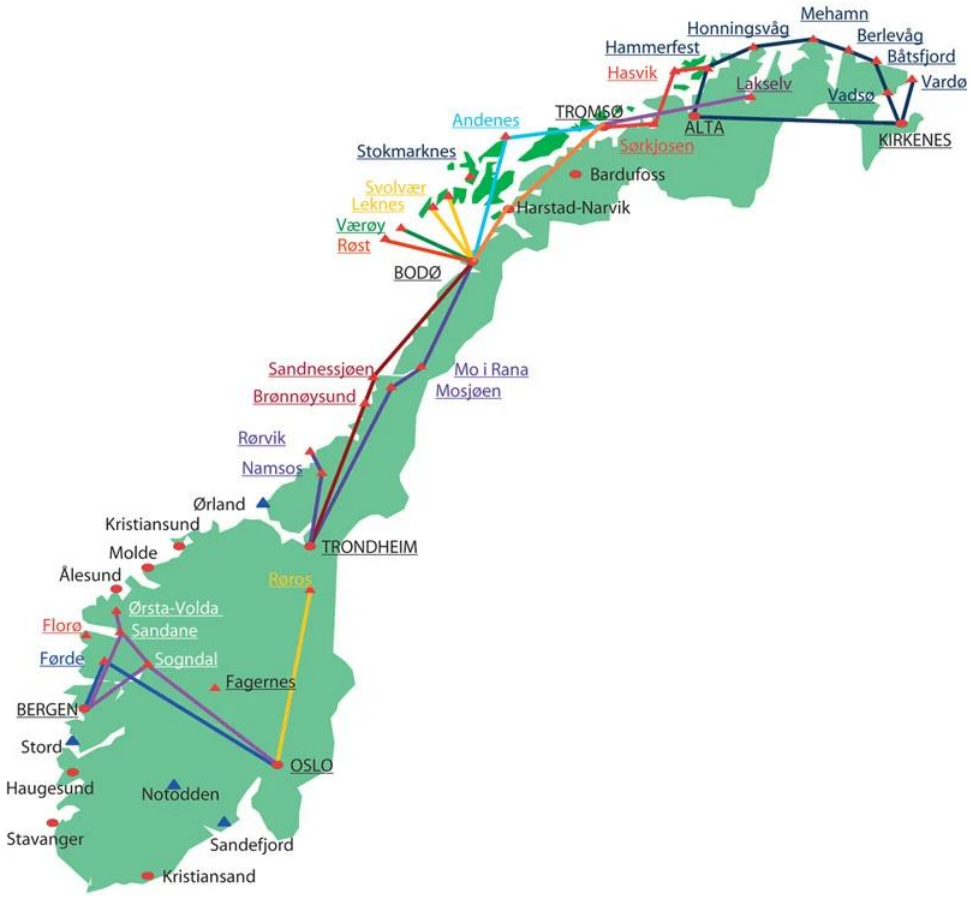

Figure 3: Overview of Norwegian PSO routes per October 2019

As seen in Figure 3, the PSOs are mainly concentrated in Northern-Norway and serve some smaller airfields in the Western part of the country as well.

The short fields of runway lenghts down to 800 metres require operating these fields require specialized aircraft that manage to take off and land on significantly shorter runways than larger airfields in more central geographic locations. Widerøe, who operate most PSOs on the current tender, have termed the operations “Special Operations” due to the unique operating conditions. While the airport category sets a training standard higher than lesser categorized airports, Widerøe also enforces specialized crew training, and the pilots receive more than the legally required minimum training in simulators. The operations have numerous exemptions from the pan-European standard rules for operations, due to the unique geographical and topographical challenges of Norway.

2.2.6 Factors influencing the Norwegian operational environment.

The Norwegian climate and topography pose challenges for aviation. In the winter, rapidly emerging storms known as polar lows make the weather highly unpredictable (Terpstra &

Watanabe, 2020). Once the storm arrives it is associated with high degrees of precipitation and strong winds. While the storms may pass quickly, airfields can be shut down for longer periods of time due to snow clearance. This necessitates that the pilots are in control of, and can upload the necessary amount of fuel to stay airborne for time needed to recover the runway to an operational state.

3 Method

This section will explain the methods used for this project, as well as the theoretical reasoning behind the choices.

The first part will describe the literature search, how it was conducted, and the reasoning for choice of literature. The second part will give an overview of the research type, while the and describe the research design process. This will give insight into data capture, sample selection, sample data and sample adequacy. Section four will detail the intricacies of interviews, from interview guide design, conduct of interviews and reflections on the interviewer role. Section five will present the analysis strategy, while the final two subsections address research ethics and methodological limitations.

The study was conducted using qualitative method, by way of a Grounded Theory Method approach. The data capture method was semi-structured interviews, and the interview participants were strategically recruited. The data analysis was performed according to Grounded Theory Method analysis, with open and axial coding as a basis for developing core categories for theory development. Strauss' (1987) coding paradigm and Ash' (2007) general model of social action were used as a basis to structure the coding to a tree for analysis.

3.1 Literature search

The initial literature search was conducted without much experience with literature searching. The search consisted of using common terms like "change management and aviation" to find relevant literature in the University of Tromsø database and Google scholar. The literature was then categorized based on theme and sorted on relevancy for the thesis. The initial search and sorting of relevant material yielded 27 articles and 10 books. After the initial search, the help of a university librarian was sourced. This resulted in much more precise Boolean search terms, as well as the expanding the search scope to include the Web of Science database. The search terms and number of hits can be found in Appendix A. If further literature study was

needed, the principles of the search technique described in this section and the search terms in Appendix A was used.

The literature was categorized by theme and sorted into folders for review. The categories were defined superficially to have a basis for systematic review. The preliminary sorting and defining of categories may have resulted in some errors in literature categorization or cases of literature adhering to one or more categories. The initial literature categorization did not influence if the literature was deemed relevant or not, only how the literature related to the research question was of importance for categorizing relevancy. The categories and results of the literature review can be seen in Table 3.

Table 3: Literature search and review categorization

Category	Number of articles	Number of relevant articles
Aviation and Management	12	4
Books (uncategorized)	13	3
Change and Sustainability	7	1
Change Failure	4	1
Change Management Theoretical Discussions	16	10
Change models, methods and case studies	9	5
Change Readiness	26	17
Change Risk & Safety	7	2
Leadership and Change	8	3
Total	102	46

3.1.1 Choice of literature for theoretical foundation

A choice was made to build the theoretical foundation of the thesis on literature that is peer-reviewed and adheres to scientific standards of research credibility. The intention is not to discredit any authors or insult any best practice advocates. But in a field where much of the academic literature is founded on assumptions which have been largely refuted, being especially selective in choice of literature and sources has been deemed of high importance for the credibility of this thesis. Practitioner literature has also been reviewed during the literature search and review. However, most, if not all, the literature was considered anecdotal, and many claims were unfounded with regards to citations and tended towards opinions based on personal experiences rather than knowledge gained from research.

3.1.2 Parliamentary notices and reports

The literature review also consisted of reviewing published material on the zero-emission transition. This was deemed necessary to contextualize the transition, as well as gaining an understanding of what steps had already been taken with regards to transitional progress. The literature was sorted between governing documents, reports and support literature. The governing documents are mainly in the form of parliamentary notices, while the reports cover topics from the governing documents in more detail. The list of parliamentary notices can be found in table 4, and the reports and supporting documents can be found in table 5.

The total number of documents reviewed is substantially higher than what the tables suggest. This includes consultation responses, invitations to tender processes and documents governing climate agreements. These documents are cited in text and the reference list according to the chosen citation standard where applicable. The listed literature in Table 4 and 5 are considered important for understanding the governing structure of the transitional process, as well as give insight into what specific analyses and measures have been done with regards to realising the transitional goals.

In the absence of change management literature, the governing documents will also be utilized in the findings and discussion section.

Table 4: List of Parliamentary Notices

Title	Author
Bærekraftig og sikker luftfart: Nasjonal luftfartsstrategi 2022-2033.	Ministry of Transportation
Klimaplan for 2021-2030	Ministry of Climate and Environment
Nasjonal Transportplan 2022-2033	Ministry of Transportation

Table 5: List of reports and supporting documents

Title	Author(s)	Commissioned by
Års- og bærekraftsrapport	Avinor	
Bærekraftig og samfunnsnyttig luftfart	Avinor, LO, NHO Luftfart, Norwegian, SAS & Widerøe	
Forslag til program for introduksjon av elektrifiserte fly i kommersiell luftfart	Avinor & Luftfartstilsynet	Ministry of Transportation
Fra statussymbol til allemannseie – norsk luftfart i forandring	Ministry of Transportation	
Forslag til offentlig kjøp av regionale flyruter: Utarbeidet på oppdrag for Samferdselsdepartementet	Oslo Economics, Norconsult & Handelshøgskolen ved Nord universitet	Ministry of Transportation
Luftfartstilsynets Årsrapport 2022 inkl revisjonsberetning	Luftfartstilsynet	

Virkemidler for fremtidig utvikling av grønn luftfart I Norge	Menon Economics & Green Future AS	Ministry of Transportation

3.2 Research type

The study was conducted using a qualitative method. The research question should guide the method, and qualitative research allows the researcher to generate knowledge from the inner experience of participants and generate meaning from these experiences (Strauss & Corbin, 2008). The lack of previous change management theory not relying on unsubstantiated assumptions, as well as the complexity inherent in change processes made a Grounded Theory Method (GTM) approach suitable for this study (Urquhart, 2013). Grounded theory is a method of discovering theory systematically obtained from social research (Glaser & Strauss, 1967, p. 1). GTM can also be applied in a more generic sense towards theoretical constructs derived from data which is analysed qualitatively (Corbin & Strauss 2008). GTM has also been utilized in a variety of fields outside of its origin field of sociology and is especially suited in management and organizational studies for examining processes such as decision making, socialization and change (Locke, 2003). The lack of formal and substantive theory in change management is also an advantage for utilizing GTM, since the coding procedures should be as distanced from theoretical presumptions as possible (Corbin & Strauss, 2008). The theoretical foundation being based on disassociating from assumptions not only serves as guidelines for change management, but also inherently assists in coding without theoretical bias.

In GTM, the analysis is carried out in parallel with data capture (Glaser & Strauss, 1967). As the theory emerges, the data guides where to derive samples for further exploration of concepts (Corbin & Strauss, 2008). When a concept is well defined and explained it is said to be theoretically saturated (Corbin & Strauss, 2008), or when a category derives no new discoveries through analysis (Strauss, 1987).

GTM does not discriminate against quantitative data and has very few limitations as to what data sources that are suitable for analysis (Strauss, 1987). As previously mentioned, the research question should guide the method, and doing any form of quantitative work with regards to change management could not be substantiated once the discovery of theoretical deficiencies was done. Obtaining data for rich, thick descriptions to contribute towards theory

building became the primary justification for choosing qualitative method in general and GTM particularly.

3.2.1 Data capture method

GTM is suitable for analysis from a wide variety of data sources (Strauss, 1987). Since the research interest is in deriving detailed explanation and rich descriptions of the pilots' views on the zero-emission transition, interviews were chosen as the data gathering tool. There are several interview forms, such as structured, semi-structured, open and elite interviews (Kvale & Brinkmann, 2015). For this thesis, semi-structured explorative interviews were deemed suitable, since the area of interest is a complex problem to be explored (Kvale & Brinkmann, 2015). Explorative interviews are somewhat unstructured since it seeks new knowledge and information on a topic, so the structure is less rigid than other interview types.

The intention at first was to interview both change instigators and agents, but as the research question evolved it became apparent that investigating the specific nature of the zero-emission transition and identifying common themes amongst one stakeholder group would be a comprehensive enough task.

3.2.2 Sample selection and recruitment of participants

The selection of participants depends on accessibility, the range of participant roles for the specific problem and whether these roles provide the intended knowledge of the research object (Jorgenson, 1989). The determining factor with regards to sample selection became accessibility. Once the research question formulation and stakeholder identification was completed, the process of interview recruitment started. The initial intention was to interview leading personnel at Widerøe Zero, since the transitional success at the stage it is in now is highly dependent on technological development. They decided not to interview because of administrative capacity as well as a research question which delved too deeply into a sensitive core of their business. The process of recruitment continued with attempted communication with Green Aviation Norway, since two of the listed contact persons in Green Aviation Norway are the authors of the Suggested program for introduction of electric aircraft in commercial aviation (Avinor & Luftfartstilsynet, 2020). Since these representatives are employed by the Norwegian CAA and Avinor and appear deeply involved in the sustainable aviation transition their potential contributions seemed valuable. The inquiries were sent to the listed contact addresses but received no response.

While interviewing change instigators would be of great value, interviewing change agents was considered of equal value when change instigator availability became scarce. The reason why interviewing pilots as a stakeholder group is considered important is that the pilots are positioned to exert a substantial amount of influence on whether or not the transitional goals can be met, through their willingness or reluctance to utilize new technology as it becomes available. Therefore, understanding the contributions and potential objections from the pilots was deemed as a potentially high value contribution to the transitional process. Also, having pilot experience probably does allow access to certain samples which are unavailable to researchers that are not trained aviators.

There were several Norwegian and Scandinavian airlines to approach for inquiry of participation in the study. Widerøe was deemed the most appropriate candidate to approach, both because of its emerging role in zero-emission aviation through Widerøe Zero, but also through its role as operator on most of the Norwegian PSO routes.

Contact was established with Widerøe, where a former pilot colleague initiated contact with Widerøe's Manager Crew Resources. The Manager of Crew Resources was presented information about the project and why the research is considered important (Jorgenson 1989). After some deliberation with other members of the Widerøe administration and answering follow-up questions, permission to interview their pilots was received.

The Manager Crew Resources was sent a letter of request to partake in the study (Appendix C). This was distributed by e-mail to all pilots in Widerøe. The letter was an aggregated version of the consent letter the participants later had to sign prior to the interviews. The letter of request included a link to a survey in which the candidates could indicate interest in participating in the study. The survey was created in Nettskjema and was open for response for 14 days after distribution. The reason why this period was selected is because of Widerøe's 7 day work, 7 day off-rotation, to make sure that those who potentially do not read work e-mails during their time off were also given the chance to participate. After the deadline passed there were 12 candidates who had volunteered for interviews.

The 12 candidates were contacted via e-mail to schedule interviews. The e-mail was sent with a link to another survey through Nettskjema where each candidate could suggest three potential dates for interviews in a certain date range, as well as any preferred time of day. The reason for letting the candidates suggest dates and time was to cater to their work schedules as

well as respecting them potentially using time off work to contribute to the study. This survey was open for response for 7 days, which in retrospect probably was too short of a time frame due to the argument presented in the previous section. Once the survey was closed, interview dates and times were arranged with seven participants. Participant biographical data can be seen in table 6.

Table 6: Biographical data of participants

Participant code	Title	Age	Operations
FC1	Captain	50 – 59	Regional
FC2	Captain	50 – 59	Special
FO1	First Officer	20 – 29	Regional
FO2	First Officer	40 – 49	Regional
FO3	First Officer	30 – 39	Special
FO4	First Officer	30 – 39	Special
FO5	First Officer	30 – 39	Special

3.2.3 Sample adequacy

Contrary to quantitative methods, statistical significance is not the aim in qualitative research (Strauss, 1987). The knowledge and data supplied in qualitative methods is largely unquantifiable and dependent on meaning rather than representation (Kvale & Brinkmann, 2015).

The sample data shows a spread in age, title and operations area. The respondents are all male and represent all groups apart from age 60-65 years. There is an almost even spread in participants from the different operational categories.

3.3 Data capture

3.3.1 Interview guide design

Since the interview type chosen was semi-structured explorative interviews, an interview guide was developed. An interview guide is a script which loosely or tightly structures the course of the interview (Kvale & Brinkmann, 2015). The interview guide was designed in a matter deemed purposeful to elicit the necessary information on the topic, but not too rigid since following up and probing on the participants responses is a vital part of explorative interviews. The intended knowledge was therefore defined prior to wording the questions. The reason for doing this was so that probes and follow-ups would be based around the intended knowledge and participant response, not the question itself.

The interview guide was tested. It was distributed to two pilots, one with an academic background and one without, as well as to a non-pilot with an academic background.

3.3.2 Conducting the interviews

The interviews were conducted over a four-week period. The initial plan was to conduct the interviews over a period of two weeks, but some rescheduling had to be done after the initial plan was set. Six interviews were conducted digitally through Zoom and one was done physically. The interviews were all scheduled for one hour and ranged from 37 minutes to 67 minutes.

As described in section 3.2.2, the interviews were scheduled ahead of time and the interviewees had been requested to be in an environment which limited potential disturbances. The physical interview was conducted in a reserved meeting room for the same reasons. The digital interviews were video recorded on Zoom, as well as audio recordings on a digital voice recorder and on an iPhone 13 Pro[2]. The physical interview was recorded on the digital voice recorder and iPhone. Field-notes, probing questions and other observations were noted on an iPad. The interviewees were informed about the notetaking, and the notes were taken in a PDF-version of the interview-guide which was prepared beforehand.

[2] The interviews were recorded through Nettskjema's Diktafon application which stores the recorded audio according to GDPR and is approved by NSD and Sikt.

Kvale & Brinkmann (2015) advocate setting the interview stage. This was done prior to starting the interview recording, the interviewees were reintroduced to the interview topic and the intention of the interview. The participants were reminded of their consent and their possibility of retracting their consent at any time during or after the interviews. The participants were informed that the study was not commissioned by Widerøe and that only the interviewer knew of their identities.

During the interviews, the interview guide was followed for the first one or two questions before the interviewer focus was on active listening and following up on participant response. If the respondents touched on topics that were later in the interview guide, the focus would be on probing the current topic rather than following the chronological order of the interview guide. Having intimate knowledge of the guide allowed for "checking all boxes" with regards to the intended topics regardless of the order of the questions.

After the interviews were conducted and the recordings were stopped, maintaining a level of comfort with the interviewees was still prioritized. The participants were informed of the possibility of contacting the interviewer, as well as gaining insight into their respective transcriptions if desired.

3.4 Data analysis

3.4.1 Transcription

After conducting the interviews, the data was transcribed. Audio data was uploaded to Microsoft Word and the default transcription function was used for initial conversion from audio to text. The initial transcription was flawed, so the audio was also played back, and the transcription corrected whilst listening back and correcting errors from the automated transcription. The process of transcribing the interviews took about one hour per ten minutes of audio data and lasted between four and six hours per interview.

Interview transcriptions are prone to loss of contextual detail and the quality is dependent on the knowledge and skill of the transcriber (Miles & Hubermann, 1994). While transcribing every detail of the conversation can be warranted, it was not considered necessary for these interviews. If there were distinct pauses, laughter, or other forms of conversational distinctions during the interviews, these were transcribed to preserve the emotional setting of the interview where needed. Had the topic been tied to emotions evoking trauma, deeply personal experiences or other subject matter of the same category, details which reproduce or

represent the emotions confronted in the interview could be necessary to find deeper meaning in the analysis (Strauss, 1987). Since the knowledge intended through this study is based on experience and professional opinions rather than emotion, the analytical process should not be influenced by not transcribing every nuance of the conversation.

3.4.2 Coding

Coding is the process of conceptualizing data (Strauss, 1987). The coding was done in three stages open coding, axial coding and selective coding (Strauss, 1987). The goal of this process is to generate theory around a core category or more (Strass, 1987).

3.4.3 Open Coding

Open coding is coding intended to open up the latent information in the data. Coding is considered the most challenging aspect of qualitative analysis for novice researchers (Strauss, 1987). The coding process started with open coding by hand in a PDF version of the interview transcripts, rather than coding directly in an analysis software. Not having much experience in coding interviews, it was apparent that being thorough and understanding the mechanics of coding probably would lead to a better understanding of generating meaning from statements. The interviews were analysed sentence by sentence or by paragraph where deemed appropriate and open codes were generated (Strauss, 1987). When sentences or paragraphs of a certain theme triggered by the interview questions and probe questions transitioned to another topic unrelated to the previously coded section, the sentences and codes were tabulated in a Microsoft Word document. The tabulation systemized the handwritten codes, and also included reflections on the previously coded section's main theme. It also served a purpose in the identification of axial codes derived from the open codes and as a memo for occurring thoughts throughout the coding process. The coding was done by way of Strauss' (1987) coding paradigm in which the codes are related to conditions, strategies and tactics, interactions among actors and consequences.

The interview transcripts and open codes were then transferred to Nvivo 14 to do further analysis. Once the open codes were coded in the software, the codes were exported to Microsoft Excel. From Excel, the open codes were sorted by thematic context to identify axial codes. The data itself provides the number of applicable codes (Jorgenson, 1989). The seven interviews yielded a total of 523 open codes.

3.4.4 Axial coding

Axial coding is a procedure of coding more intensely around single categories (Strauss, 1987). The initial clustering of open codes led to 21 themes, which were condensed further to 6 axial codes, identified by the stapled boxes in the coding tree.

An example of how open codes were coded around evolving themes and developed to axial codes can be seen in figure 4.

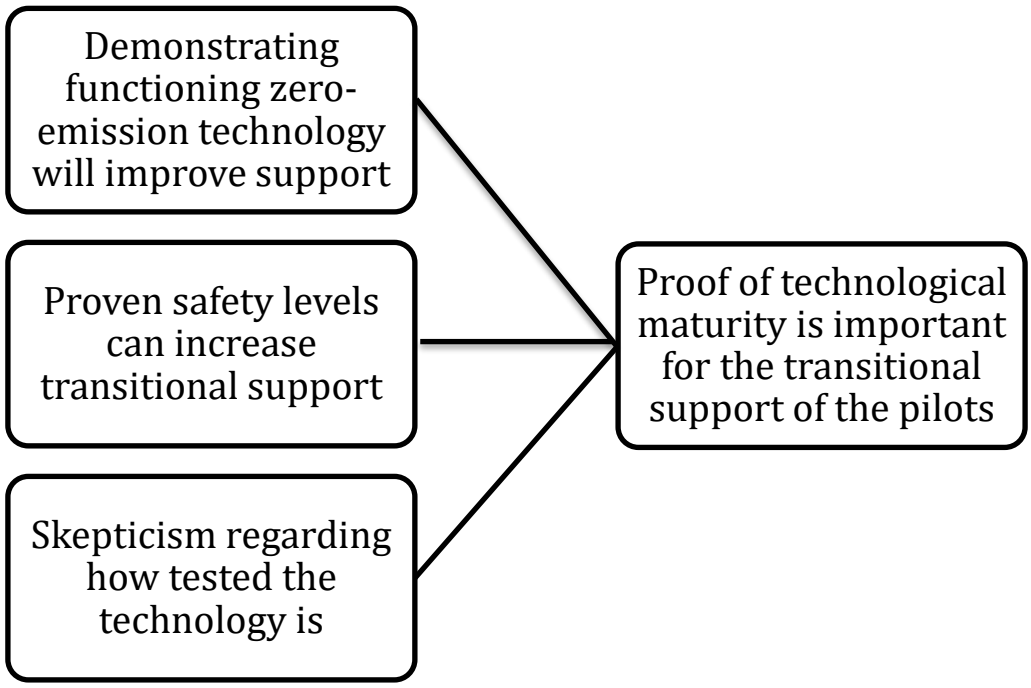

Figure 4: Axial code development

3.4.5 Selective coding

Selective coding is systematically coding to identify the core category (Strauss, 1987). Amongst the actors and for the pilots, the category which started to emerge was trust. Trust in the change instigators and their motivation for the transition. Trust in that the communicated transitional motivation is genuine, hence "proof of motivation for transition". Trust also related to the external conditions of time and technological maturity. It was also deemed that trust could influence change agent attitude and behaviour, and therefore directly influence the success transitional process. The pilots also have to be able to trust that they are a part of the zero-emission future and envision themselves in it to increase transitional support.

3.5 Structure of the coding tree

As a visual tool for structuring the codes and assist in analysis, a coding tree based on Strauss' (1987) coding paradigm and Ash' (2007) further developed general model of social action was designed. The entire tree structure can be seen in figure 4. The tree is also included in an enhanced version in appendix C.

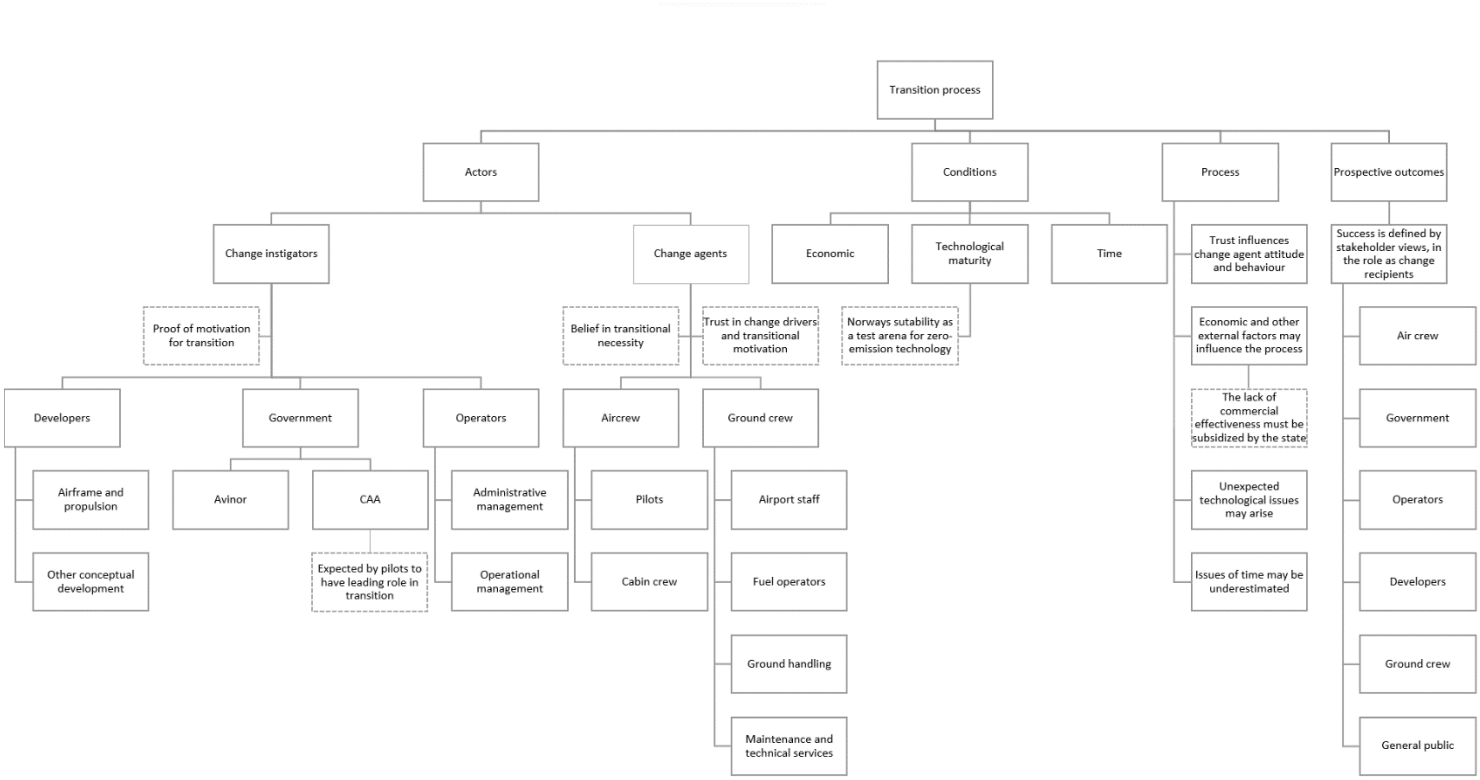

Figure 5: Transitional Process Coding Tree

The tree is structured by actors, conditions, process, and prospective outcomes. This way of presenting the coded data gives a basis for building a logically structured argument which shows causes (actors and conditions) and effects (process and prospective outcomes) in the transitional process (Ash, 2007). The boxes with dotted lines are axial codes, and it is implied that the code is related to the respective part of the tree in which is it situated.

3.6 Research ethics

Prior to commencing data capture, a data management plan in line with the requirements of The Research Council of Norway was created. A notification form was also filed because the project involved the storage of personal data. The approval for storage of personal data was

received 10.05.2023, and all data were stored in Office-365 according to University of Tromsø policy. This includes tape recorder data which was uploaded to Office-365 and deleted from the recorder after uploading.

The participants all signed informed consent forms prior to interviewing. The consent form can be found in Appendix E.

Some of the participants are prior acquaintances to the interviewer, but this was not considered to influence their opinions on the subject matter or the interview setting.

The notion of bias was also a large consideration during and throughout the project. Necessary precautions were taken to ensure that being a pilot previously did not affect the research credibility.

The interviews were conducted in Norwegian, but the thesis written in English. All translations of interview data were done with the utmost care and scrutiny to

3.7 Methodological limitations

GTM has been criticised for having many adaptions, evolutions and applications, so many that even the authors of the original theoretical framework ended up in very real disagreements (Urquhart, 2013).

A limitation in the thesis itself is that the method was not utilized to the extent it could have been. All the interviews were conducted beforehand using the same interview guide, and the analysis was done in the aftermath of all the interviews. This may have hindered the development of the emerging theory. While the role of the interviewer was gradually more comfortable, and utilizing explorative interviews in a sense may have unintuitively assisted in counteracting the implications of not utilizing the theory as intended, there is a feeling that the theory could have emerged even more if GTM was done properly.

4 Findings and discussion

This section will present the results from the interview, analysis and discuss related findings.

The first subsection will describe the analysis structure by giving an in-depth presentation of the coding tree and how that serves as the analytical foundation. The second section will discuss the findings and analysis of the core category trust. Trust will be related to both the

actors and the external conditions where trust can be considered as exerting influence on transitional belief.

Following this, the conditions branch will be discussed. This will be done as a comparative analysis between the information found in the documents in table 5 and findings from the interviews. Economic, technological and timing factors will be discussed and selected operational ramifications of the conditions will be presented. The final section will discuss the prospective outcomes and consequences branch, with respect to selected change actors as recipients of the transitional process.

4.1 Structure of analysis by way of the coding tree

The first branch, regarding the transitional actors is distinguished by change instigators and change agents per the definitions from section 2.3. The primary data indicates that trust in, and between the actors is paramount for a successful transition. The interviews also give indications of what the participants expect from the different change instigators and agents. The tree supplies a broader spectrum of actors than the ones who will be the focal points of discussion. While this may complicate the tree structure somewhat, a point of designing it in this way is to provide a visual aid not only for assistance with analysis, but also to understand and underscore the vast complexity of the zero-emission transition in aviation. This includes an extended but not all-encompassing insight into the number of stakeholders involved. The Department of Climate and Environment and the Department of Transportation were included in figure 1, when presenting an overview of the transition change instigators in the introduction. However, reduce the visual complexity, these entities can be deemed as included under government.

The conditions are external factors which influence the transition. Economic factors are placed at the top of the branch, since the participants believe that securing funding is a premise for transitional success. This is a factor which is largely unrelated to trust, although the interviews show that issues regarding funding may influence the belief in transitional feasibility. Technological maturity is one condition which is influenced by trust, and one which the participants deem of utmost importance. This factor is also influenced by Norway's suitability as a test arena for zero-emission technology since the level of technological maturity also must handle the potentially harsh operational conditions of the Norwegian PSO routes. The final factor is time, which is influenced by both economic and technological

factors. The results also show that the change agents belief in transitional feasibility is also influenced by time.

The process branch consist of different ways in which trust, economics, technology and time may affect the transition. The issue regarding trust is placed on top in this branch since the degree of trust among and in between actors has a major effect on the transitional process. This section will also address the expected decline in commercial effectiveness when transitioning to zero-emission aircraft, as this was something all of the participants did comment on during the interviews.

The prospective outcomes are sorted by actors. The reason for this is that the transitional process, actors also become recipients of the implemented changes. The prospective outcomes therefore are actor dependent, and the success criteria is defined by them as actors and evaluated from an angle as change recipients. The discussion will therefore be based around different success criteria for the independent actors as change recipients.

4.2 The element of trust between actors and conditions

The definition of trust is: "to have confidence in something, or to believe in someone". (Cambridge, n.d.b). The word trust was never explicitly identified in the primary data, but it was identified on basis of open coding and axial coding. Throughout the coding it was found to have relevance not only for the interaction among actors, but also with regards to conditions. This leads to exploring the concept of trust from two angles: trust between the change instigators and change agents, and how trust relates to the conditions branch of the coding tree.

4.2.1 Change instigator proof of motivation for transition may influence trust.

A unique component of the zero-emission transition process is that it consists of several change instigators that need to cooperate and coordinate. Whereas in organizational changes, the change instigators oftentimes consist of one or two parties such as management and consultants, an industry wide change such as the zero-emission transition involves more stakeholders. This is also illustrated in the actors branch of the coding tree.

There likely are differing priorities between the different change instigators, since two of the subbranches are commercial entities, while the branch termed "Government" is not. As described previously, Avinor is a commercial entity owned by the Department of

Transportation, but there has been found no evidence that Avinor has any financial gains from the zero-emission transition. Therefore, Avinor is considered a non-commercial entity on the same page as other governmental stakeholders.

The participants express that transitional belief relies on confidence in the change instigators and their motivation for the transition. Or put plainly: the participants need to believe that what is said is being done, is being done, and that it is done in accordance with the expressed reasons for the transition. The assurances that political motivations or commercial interests do not prematurely force the development of new certification regimes for new technology or put aircraft that are not thoroughly tested in production, just to satisfy an ambition of meeting stated deadlines or being a first-mover in zero-emission technology is of utmost importance for the participants. Therefore, the change agents have expectations of the change instigators, and the adherence to these expectations can influence trust in between the actors.

According to the participants, the change instigators main priority is to strike the balance between climate political priorities, commercial interests, and technological development. A sidenote regarding the change instigators main priority on this is that none of the participants did mention the governmental responsibility of serving PSO routes from a transportation policy perspective. A reason may be that the participants do not view zero-emission operations and the service of PSO routes as an either-or proposition but assume that the service of PSO routes will be prioritized regardless of the zero-emission transition. Menon (2022) does address the balancing of transportation needs and the ambition of zero-emission aviation and claim that the governments prime responsibility is to secure the inhabitants transportation needs through the PSO routes. The participants probably would have opinions on this if prompted on the issue. Had the study had more time for data capture, it would have been interesting to follow up on the pilots viewpoints on balancing climate politics, transportation policies and technological development throughout the transition.

With regards to balancing technological development and emissions reductions, FO5 stated:

> "I am not a huge fan of being a test pilot in this. On the other hand, I am not one of those who believe we should be flying the old planes just because that is safe. The development must proceed, and it must be done to be a part of this sustainable society we have committed to become."

This was further elaborated: “The transitional stakeholders have responsibilities here so that the process is not rushed, but that the development is done in due time. That is applicable for the politicians as well”. FO4 also has an expectation that: “no decisions or processes should be rushed so that aircraft that are not thoroughly tested are pushed into production”. FC2 expresses that: “scepticism may rise if the transition is implemented based on political pressure.”

The participants therefore expect the change instigators to allow for thorough testing of new technology before it is introduced in operations.

4.2.2 The pilots expect the CAA to be the mediator of the transition.

The participants all express high expectations to the CAA. Since the CAA are responsible for regulation and certification, the pilots view them as FO5 states: “the stakeholder wielding the most responsibility.”. FC1 underscores the sentiment with saying: “the CAA are the only brake we have, because someone will always try to be smart if they are allowed to”.

As the governmental representatives in the transition, Avinor and the CAA seem to have an undefined relationship with regards to transitional leadership. The participants did not mention Avinor as a transitional stakeholder at all and seeing them as a more active party than the CAA would probably be somewhat surprising to the participants. The CAA are the regulating entity but seem to have a less active role than Avinor from the information that can be sourced publicly. As FO3 stated: “the CAA will probably be lagging behind the technological development and transitional progress”, and this will hopefully not be a fulfilled prophecy as the transition progresses.

Adding more complexity, neither Avinor nor the CAA seem to have any influence over economic factors in the transition either, so that leaves the governmental responsibilities in the transition distributed amongst a trifecta of actors that do not seem to have a stated purpose with different initiatives. The roles they currently serve is Avinor as a form of commercial initiative driver, the CAA as a regulatory entity which is somewhat passive and the Ministry of Transportation as the holder of economic responsibility. Making the matters even more complex is the CAA’s role as a coordinating entity towards European organizations such as European Union Aviation Safety Agency (EASA) who may also impose certain European legislations on the transitional process. Therefore, a suggestion is that the governmental entities work closer together and define their purposeful roles as the de facto leaders of this

transition, and a more active role from the CAA in the transitional process could build more trust towards the change instigators as a whole.

4.2.3 Trust relating to external conditions.

While the trust amongst and in between actors is of high importance, trust is also related to the external conditions. Not as much in the economic factors, which are considered a premise and necessity for the transition rather than something which directly influences processual trust. The pilots are intelligent customers and will probably scrutinize the details of new technology being introduced. This relates to trust in the technological maturity and time. While proof of technological maturity is an own category which will be discussed regardless of trust, the influence of trust on technological development is also paramount. Several participants mention the new certification regimes that must be developed parallel to developing the technology. The participants did mention the Boeing 737 MAX accidents, in which the certification regimes were found to be insufficient (U.S. Department of Justice, n.d.). This led to two accidents and intense scrutiny as to certification regimes may be hampered to serve other causes. FC1 stated that: “New aircraft must be constructed to suit the propulsion technology. And that takes time”. Therefore, trust that sufficient time is given to develop new technology is considered of high importance on the pilots belief in the transition.

4.2.4 The participants suggestions to building trust between change instigators and change agents

The participants also had suggestions as to how trust between change instigators and change agents can be built. First of all, being honest about the transitional challenges is considered important. Not for the pilots to have a field day with the transition seemingly not going well, but to build trust in acknowledging that the transition is complex and has many unknown bumps in the road along the way.

Also, conveying information in an appropriate manner can build trust. FO3 stated that:” you can have a fancy PowerPoint and a presentation and say that this is how it will be, because we have done the maths on that”. FO1 supplemented this statement by claiming that: “If the information does not explain why we are doing changes, then you will never be able to convince the majority to join the changes”. This suggest that the timing and medium of information must be considered, while intention and rationale must be conveyed to build trust.

The final point in building trust is inclusion. The participants expect the pilot view to be considered in the transitional process, but do not know who is the representative of their

views. Some participants suggested the Unions and other suggested airline operational management. What is apparent through the study of governing documents is that the pilots viewpoints have not been included in the material that has been produced so far. To further build trust in the process, including pilot representatives or operational managers from the airlines can be useful.

4.3 The effect of economic factors, technological maturity and time on the transitional process

This section will address the conditional factors found in the coding tree.

4.3.1 Economic factors influencing the transition

The development and implementation phase of zero-emission technology will probably decrease the commercial effectiveness and thereby increase the operational costs for the PSO operators. While the PSO routes primary mission is to serve routes that are not suited for commercially viable operations, the routes must make sense for operators to service, also from a commercial perspective. FO3 described the green shift as an introduced problem, in that it is not anything commercial actors would willingly introduce for competitive advantages. This leads to a somewhat precarious situation of whether the government or state has any responsibility with regards to compensating for the lack of commercial effectiveness which results from the zero-emission transmission.

When questioned about the greatest challenges towards a successful transition, all the participants spoke about economic challenges surrounding the transition. FC1 claimed that:

> With the situation now, the increasing costs facing operators, the high inflation rates, a weaker [Norwegian] krone, high oil prices, there are barely any airlines making money. In addition to keeping the company afloat, it also must afford to support the development [of new technology] and buying new aircraft. That requires some carrots, and not just whips from the politicians.

The main challenge economically is that aviation is a marginal business (Markopoulous & Hesse, 2021), while developing new technology is costly (Oslo Economics, 2022). Therefore, the participants view the transition as impossible if it is to be driven economically by airlines and developers. In the participants view, the development is totally dependent on external funding. Since the costs of the transition are dependent on technology which so far does not exist as well as an operational platform that has capabilities which are only speculative at the

present time, in the words of FO1 it is a: “question if [the commercial actors] investments are enough, or if bigger and stronger party such as a state is needed to reduce the risk of investing in new technology”.

4.3.2 Economic challenges facing technical development and implementation.

The development of new technology is in an early stage, and new technology must also be tested and certified before it can be used operationally (Avinor & Luftfartstilsynet, 2020; Oslo Economics, 2022). As described in section 1.1, the transition towards zero-emissions is one carried out largely due to climate policy and commitments to international agreements. Therefore, it is not a development that is driven by gaining competitive advantages or furthering cost reductions for airlines.

Since aircraft and propulsion technology developers also are businesses, their research and development need to ensure profitable endeavours. This implies the production of technology which ensures the highest degree of performance and safety, while also ensuring technological development which makes the most sense from a business perspective. The highly specialized equipment used for PSO operations with gas turbine engines is nearing its expiry date, and the development of zero-emission technology has reached airframes capable of 9 to 19 passengers. If zero-emission aviation is to resemble the conventional aviation of the present, it is highly doubtful that the market for specialized regional aircraft will generate the highest return on investment once development for larger aircraft is initiated. FC1 called the market a niche, and the availability of equipment has become a limiting factor for continued operations. Avinor & Luftfartstilsynet (2020) also consider the risk of not developing the necessary equipment which can tolerate Norwegian winters and short-field operations if Norway is not a first mover in the zero-emission transition. Combining a niche market with a demanding operational environment requiring special equipment with limited return on investment for developers and operators does probably necessitate some governmental subsidies for realizing the transitional goals.

4.3.3 Economic factors challenging future operations.

The increasing competition has rendered the airlines to focus on cost control, and investments outside the airlines main activities have largely decreased. This includes reduced investments in technological development as well. The main premise for the awarding of the PSO contracts is that the operator which has the lowest cost per flight is awarded the contract. If

the cost cannot be separated between two bidding parties, the contract is awarded based on who supplies the highest seat capacity. (Samferdselsdepartemenetet, 2023, p. 23). The new PSO structure also limits the maximum price of tickets, which also lessens the operators ability to increase prices if needed.

4.3.4 The PSO tender structure requires more airframes to maintain seat capacity.

Battery technology in aircraft is currently available for 2 to 4 passengers, and development is in progress for aircraft with up to 19 seats and a capacity of 350 – 400 km (Oslo Economics, 2022). The interview participants view of future operations are divided. FC1 expresses that "if the technology allows for aircraft up to 19 seats, it will be like flying Twin Otters again. Widerøe knows this operation, it is just a matter of fetching some old manuals from the basement. So, we should be able to handle that". FC2 states that "everything around [the operation] stays the same, it is just the propulsion that changes". FO3 and FO4 also mention a future scenario where electric vertical take-off and landing (eVTOL) aircraft can be utilized as feeder units from smaller island communities to larger regional centres[3]. Despite the participants mentioning specific developmental solutions, this section will not consider the specific operations associated with the respective development projects, but rather the identified changes that will need to be addressed in the development and implementation phase regardless of technological initiative.

The PSO public tenders are designed to ensure a certain seat capacity on each of the tendered routes (Samferdselsdepartementet, 2023). The smallest aircraft operating the PSO routes by today's operator has 39 seats (Widerøe, n.d.). The load factor is the ratio of paying passengers to the number of available seats (Cambridge, n.d.a). While no data was found about load factor on PSO routes, the number is partly irrelevant so long as the total seat capacity between destinations is the desired metric for the PSO tenders. The reason why load factor could be of interest is because it could help determine the potential consequences of reducing the number of seats available per aircraft, which is what seems to be likely in the zero-emission operations in the development and implementation phase. While this is a consideration for

[3] Widerøe Zero have signed a letter of intent to purchase up to 50 eVTOL aircraft for this purpose (referanse). This information was, however made public after the interviews were conducted and should not have influenced the participants view.

future tenders, the current tender issued has a requirement for seat capacity, and this comes with some consequences.

A considerable consequence is that the potential reduction in aircraft seat capacity leads to an increase in the number of airframes needed to maintain the constant seat capacity production procured in the PSO tenders. In a largely simplified manner, two 19 seat aircraft are needed to replace every aircraft of 39 seats. This two-to-one ratio further increases if the number of seats available per airframe is less than 19. When describing the short-field operations in Widerøe, the pilots described days consisting of up to 11 flight legs each day as well as short ground turnarounds of 10 to 15 minutes. With a lesser developed ground infrastructure and uncertain charge times for the batteries, maintaining effective crew rostering and minimizing turnaround times may become more challenging. This will also be a cost driver for the operators. While the entire fleet will not be replaced by zero-emission technology overnight, it does represent some challenges facing the aircraft operators ability to maintain the requirements posed by the PSO tenders.

In the PSO tender, Hasvik to Tromsø is required to have two daily scheduled roundtrips (Samferdselsdepartementet, 2023). With the smallest aircraft in the current operators fleet, this is a total of 78 seats offered per day. The table depicts how many daily roundtrips are necessary for maintaining that capacity with fewer seats per aircraft. While this is a theoretical exercise and largely simplified, it does also prove a need for an increase in the number of aircraft the operator needs to maintain the same level of service as the current PSO operator provides.

	Dash 8-100	**Generic 9 seat ZE aircraft**	**eVTOL**
Passenger Capacity	39	9	4
Required departures/ day	2	9	20

When considering the findings from the interviews and information found in official reports, the proposition that seems the least realistic is where the operations are conducted as they are today, only with other propulsion. The results seem to indicate that the operations may

become more expensive, less effective and involve more aircraft than the current operation in the development and implementation phase before commercially viable operations can be prioritized.

4.4 Trust in technological maturity is paramount for the pilots continued support of the transition.

Throughout the interviews, the pilots main concern was with the technological maturity of the equipment to be used. As FO4 stated: “The only thing you really have to be sure of all day is that those two engines are functioning as they should”. This statement also transcends propulsion technology and indicates that the pilots ability to trust their aircraft and the technology also serves as a premise for the transitional support. FO1 elaborated that “there is a scepticism in that – where we are [technologically] today, one can see that it is not good enough to maintain the safety levels in todays operation”. This is underscored by FC2 when elaborating on the safety expectations of the pilots: “We are raised to think safety, safety, safety in our industry. So, that seems to be the pressure point in that: Ok, it is new, but OK: prove it”.

4.4.1 Change instigators should not underestimate the operational intricacies when evaluating Norway’s suitability for zero-emission technology

A common theme amongst the reports listed in table 5 is that they all describe Norway’s suitability for being a pioneer in zero-emission technology development and implementation. And while the statements on Norway’s suitability are not untrue, they may be biased towards wanting Norway to be suitable. Several participants agree with the notion of Norway’s suitability for introducing zero-emission technology, in that the Norwegian topography is well suited for air transport, the short distances between many locations and that the Norwegian population is familiar with sustainable technology, especially electric cars. However, where the reports seemingly underestimate the operational complexities, the several participants describe the short field operation as one which tests the pilots skills, and FO5 deemed the operation too complex for testing the technology.

While there always is a degree of speculation when discussing future technology and operations, the issues surrounding electric aircraft are more specific and certain than with other propulsion technologies. There may be alternatives with hydrogen or other hybrid technology, battery technology does seem to have evolved the furthest (Avinor & Luftfartstilsynet 2020; Menon, 2022; Oslo Economics, 2022). The challenges with hydrogen

or other technologies under development will not be addressed in detail, since these technologies are not developed to the level that electric aircraft are, and potential issues will be pure speculation. There are issues with electric aircraft not directly affected by the development of the airframe and propulsion, such as lack of electrical infrastructure, the potential capacity of the electrical infrastructure once it is established and how effectively charging can be done on ground stops. These are not considered as a direct operational challenge under the pilots' control but are considered a potential cost driver from an airline perspective. The aircraft and propulsion must also be able to handle the operational intricacies of the PSO operations, described in chapter 2. The following section will discuss some of the intricacies which should be factored in when developing, testing, and certifying new technology.

4.4.2 Weight and balance issues in short-field operations

More than one participant mentioned the precise calculations needing to be done before each take-off and landing, and others spoke about the battery weight being constant as an issue. Before each flight, the pilots must do a mass and balance calculation to ensure that the aircraft is within operational and legal limits. There are required distances for stopping distance if the take-off is aborted, clearance to terrain during the climb out segment and landing distance at the destination. These challenges often escalate in complexity as the weather becomes worse, and it is not rare that passengers on flights with smaller airframes such as the Dash 8 series are allocated to different seats after boarding to assist in issues with airplane balance. Weight limitations are not restricted to regional operations such as PSOs, passenger luggage or cargo is deloaded from medium range jet aircraft such as Boeing 737s to allow for operations in challenging conditions. The issue is, however, more precarious in short field regional operations. Oftentimes, the landing weight at the destination is limiting to the fuel allowed onboard at the departure station. An example of this would be flying to one of the islands in Lofoten from Bodø. The available runway distance in Bodø will allow the pilots to request full fuel tanks, but the landing distance at the destination will be too short for a safe landing with the aircraft weight upon arrival. Therefore, propulsion technology such as batteries will provide operational challenges in that its weight is constant, and the aircrafts weight is not reduced as the available energy decreases. The weight of a fully charged battery is equivalent to the weight of a discharged battery. Until the energy density is higher, a solution for reducing the weight to fit the operational requirements is that the technology is available only on smaller airframes with less capacity than its conventionally fuelled counterparts. This leads

to the operators having to adjust the number of aircraft and subsequent operations to suit the requirements set by the PSO tenders, as exemplified in table 6.

4.4.3 Range is the most critical and elusive component.

One issue which was brought up when questioned on what the greatest challenges of the transition would be, is the uncertainty with regards to range, especially if the propulsion technology is electric. FC1 said that “engine power is not the issue, range is”. The meteorology is a challenge, and as FO3 said: “When moving along the Northern coast, you fight the same weather at all airports”. The volatility of the weather, especially the polar lows make range a scarcity which cannot be sacrificed. FO4 stated that: “electricity is a surplus”, and that the pilots now are facing a prospective future where the need for anti-icing equipment using electric power may be using of the fuel reserves in the future. For operations in the high north, both range and anti-ice equipment are needed, and this is a potential dilemma facing the development of new technology.

4.4.4 The emergency capabilities of the aircraft must be demonstrated.

A major factor influencing the transition, perhaps as much as what can be defined as a show stopper, is the emergency capabilities of the aircraft. FO3 states that: “the technology will probably be required to have an equivalent level of safety or better than the technology today for it to be allowed into service. And that must be accommodated in the real world”. FC1 stated that: “you have seen how a cell phone acts when it combusts, and imagine that with a ton of batteries”. Therefore, ensuring the pilots that the technology is safe will impact the transition tremendously.

4.5 The participants believe the communicated time frame for implementation is too short.

The participants did see one caveat with regards to time, in that there exists among the change instigators an ambition of launching zero-emission operations in the years prior to 2030. The origin of this specified implementation time seems to be the report Suggested program for introduction of electric aircraft in commercial aviation (Avinor & Luftfartstilsynet, 2020). In it, the authors deem that: “by our assessment, it should be possible to develop airplanes to be used on short field operations in Norway (that have 19 seats and handle Norwegian winter conditions) and implement them operationally between 2025 and 2030.” (Avinor & Luftfartstilsynet, 2020, p. 8). The challenge with this statement is that it is not explicitly stated how these estimates were concluded on. The participants, who operate these routes on a daily

basis, deem it highly unlikely that the technology is developed within that time frame. In FO2's words: "electrical aircraft are kind of at the stage where we laugh at it". This was underscored by FO4 who also claimed that electrical aircraft and zero-emission are joked about. This is nuanced somewhat by FC1, who says that "the scepticism lies in whether the technology will be ready by the stated timeline for introduction, not in the technology itself".

This last sentiment is quite descriptive in and of itself. The pilots are generally not sceptical to the transition but consider the communicated timeline to be too ambitious.

4.6 Prospective outcomes and consequences

For the pilots, the prospective outcomes of the transition are highly dependent on the technological solutions that are chosen to develop. The operations may be reduced to single pilot operations, in the form of flying eVTOLs or 9-19 seat aircraft. The pilot role may be obsolete if the developers choose to pursue drone technology instead of technologies relying on pilots. There may also be aircraft with specifications suited for operations similar to the ones conducted in the present, if combustible fuel solutions that work on airframes resembling the ones today. There are a vast amount of outcomes and consequences for the pilots, but their continued support is paramount for transitional success, as long as the zero-emission transition will not happen overnight. The continued transitional support can be built through processual honesty, a proof of transitional motivation which builds the trust of the pilots.

While some of the outcomes listed above are detrimental to the pilots, a reduced crew operation can be advantageous to the airlines and operators. As commercial actors, pilot costs are one of the main expenses in airlines. While there may be disagreements between the administrative and operational management in an airline with regards to how reduced crew operations impact safety measured against the commercial gains, the choice of technological solution does not impact the airlines in the same way it does the crew.

It is also of importance to not consider a failure of meeting the goals of the Paris agreement or other environmental benchmarks as a failure of the process itself. The same is true of missing the expressed deadline of implementing zero-emission technology. Both climate goals and developmental goals need constant recalibration to fit a tomorrow which one does not know the shape of.

5 Conclusion

This thesis has explored the notion of change management in aviation by way of a grounded theory approach. The research question was: "*What methods or approaches can best be used to manage the changes associated with the transition to zero-emission aviation?"*

While this question was not answered directly, some conclusions can be drawn as to how the management of transitional approaches can be approached. The guidelines for this thesis was founded on:

- Acknowledging the complex nature of change.
- Understanding the contextual nature of the zero-emission transition.
- Not framing the transition as either failing or succeeding, but consider the many definitions of success or failure that are held by different stakeholders.
- Not assuming that interventions or disagreements are resistance, but rather view them as contributions to the overall health of the transitional process.
- Attempt to find factors that build change readiness compared to strategizing to minimize resistance.

This thesis has adhered to the guidelines, through not underestimating the complexity of change processes. A comprehensive overview of the stakeholders and the relationships amongst them have been presented. The contextual basis has supplemented with qualitatively analysed data to gain a greater understanding of the operational complexities associated with aerial operations in Norway. The transitional outcomes have not been viewed as ultimately succeeding or failing, but prospective outcomes and consequences have been evaluated from different angles. The interview statements from the participants have not been considered detrimental or oppositional to the transitional process, but rather as insights which give a better decision-making foundation for the change instigators. And finally, the analytical deduction of the core category of trust has with it several suggestions as to how change readiness and transitional support can be built.

5.1 Implications for change management

A potential implication for change management is an encouragement to stop searching for universal theories or best practice when researching change management or planning change initiatives. Do this by searching outside the realms traditionally associated with change management. I appeal to turn to safety management or high reliability organizational theory

for furthering the field of change management, since there are many parallels to By's illusions, Hughes' hopes and the theoretical guidelines in this thesis readily available within these fields. This observation was noted too late in the process for this thesis to consider doing, but that is of no hindrance for others to further progress management studies.

5.2 Future research

The work in this thesis can be regarded as a starting point for an emergent theory on change management processes in general and zero-emission transitions specifically. Not reaching theoretical saturation is no disappointment, as this is outside the scope and limitations of a master's thesis. Supplementing the findings in this thesis with the viewpoints of developers, governmental institutions, the travelling public and other emerging participants will only add more context to the transitional process and contribute towards theoretical saturation. And perhaps also be valuable contributions to the actual zero-emission transitional process.

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Appendices

Appendix A: Literature search data

Search terms related to change management and aviation

UIT library:

Term (Boolean)	Hits
Change management	2 675 094
“Change management”	32 457
Change management and aviation	7117
“change management” AND aviation	99
"change management" AND aviation OR aeronautics OR navigation OR aerodynamics OR flight* OR pilot* OR "air traffic"	781
"management of change" AND aviation OR aeronautics OR navigation OR aerodynamics OR flight* OR pilot* OR "air traffic"	120
(("change management") AND (aviation OR aeronautics OR navigation OR aerodynamics OR flight* OR pilot* OR "air traffic") AND (practitioner* OR employee*))	156

Google scholar:

Term (Boolean)	Hits
Change management	8 620 000
“Change management”	763 000
Change management and aviation	974 000
“change management” AND aviation	14 300
"change management" AND aviation OR aeronautics OR navigation OR aerodynamics OR flight* OR pilot* OR "air traffic"	54 100
(("management of change") AND (aviation OR aeronautics OR navigation OR aerodynamics OR flight* OR pilot* OR "air traffic"))	7 880
(("change management") AND (aviation OR aeronautics OR navigation OR aerodynamics OR flight* OR pilot* OR "air traffic") AND (practitioner* OR employee*))	20 200

Web of science:

Term (Boolean)	Hits
Change management	688 246
“Change management”	9 592
Change management and aviation	1 366
“change management” AND aviation	19
"change management" AND aviation OR aeronautics OR navigation OR aerodynamics OR flight* OR pilot* OR "air traffic"	235
(("management of change") AND (aviation OR aeronautics OR navigation OR aerodynamics OR flight* OR pilot* OR "air traffic"))	16
(("change management") AND (aviation OR aeronautics OR navigation OR aerodynamics OR flight* OR pilot* OR "air traffic") AND (practitioner* OR employee*))	32

Search terms related to change management and comparable industries

UIT library:

Term (Boolean)	Hits
Change management and shipping	5 570
Change management and rail	4 790
“Change management” AND shipping	68
"Change management” and rail	45

Other combinations of synonyms did not yield any plausible results for any of the comparable industries

Google scholar

Term (Boolean)	Hits
Change management and shipping	1 970 000
Change management and rail	1 840 000
“Change management” AND shipping	29 500
"Change management” and rail	19 600

Other combinations of synonyms did not yield any plausible results for any of the comparable industries

Web of science

Term (Boolean)	Hits
Change management and shipping	2 514
Change management and rail	1 308

“Change management” AND shipping	25
"Change management” and rail	19

Other combinations of synonyms did not yield any plausible results for any of the comparable industries.

Search terms related to change management and entity

UIT library:

Term (Boolean)	Hits
(("Change management") AND (organization OR organizational)	17 627
(("Change management") AND (industry OR industrial)	8 682
(("Change management") AND (global OR globally)	12 602

Google scholar:

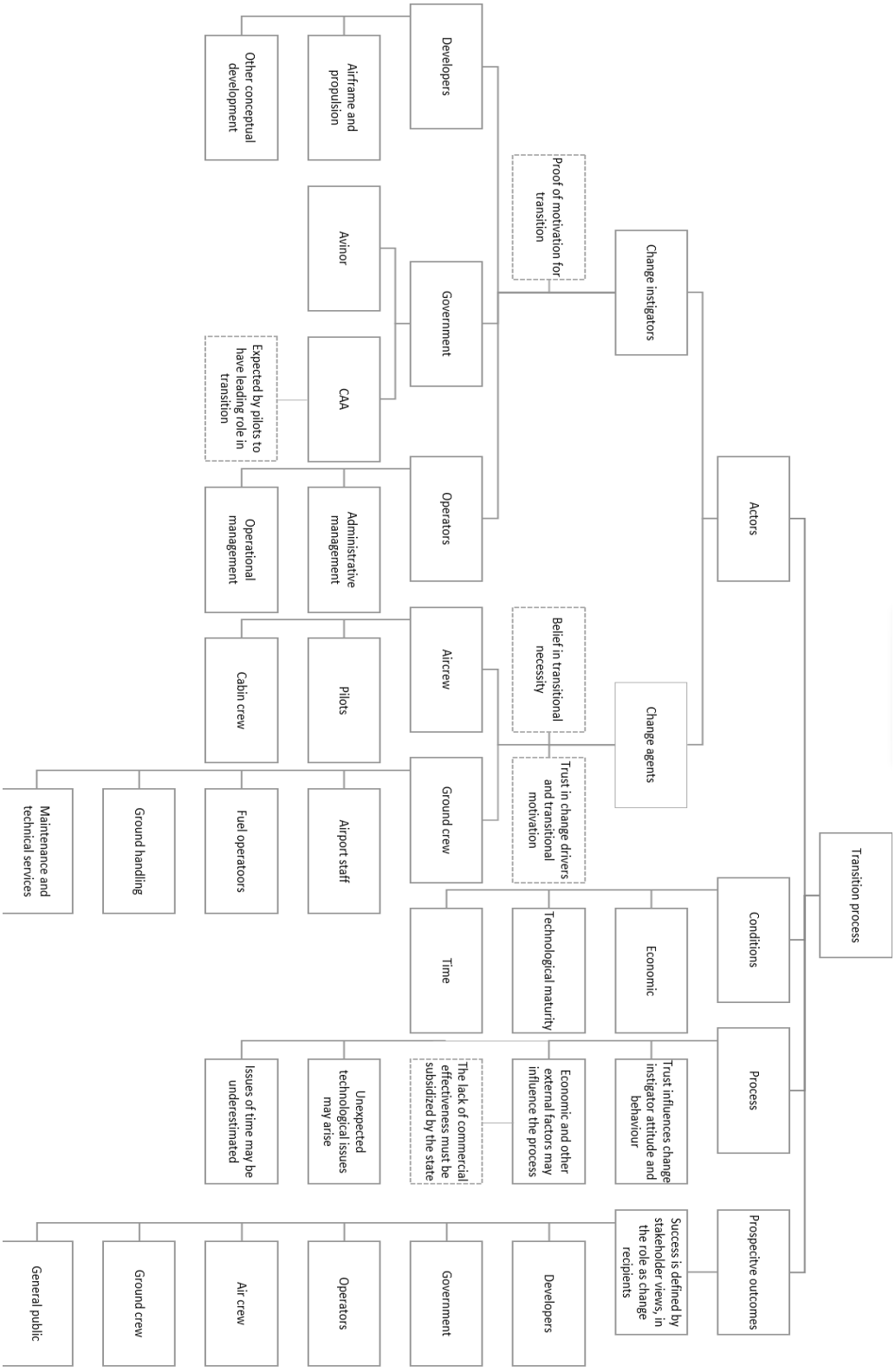
Term (Boolean)	Hits
(("Change management") AND (organization OR organizational)	756 000
(("Change management") AND (industry OR industrial)	590 000
(("Change management") AND (global OR globally)	521 000

Appendix B: Interview guide

Intervjuguide

Spørsmål	Ønsket kunnskap
"Fortell meg litt om deg» - Alder - Stillingstittel - Utdanningsbakgrunn - Flygeerfaring	Demografisk informasjon for bruk I analyse
Kan du gi en generell beskrivelse av selskapets operasjoner idag?	Beskrivelse av flygerens operative forhold
Hva er de største utfordringene med de operasjonene dere utfører i dag?	Refleksjon over utfordringer ved operasjonene
Hva vet du om elektrisk- eller nullutslippsluftfart?	Pilotens kunnskapsnivå vedr nullutslipp/ elektrisk luftfart
På hvilken måte tror du operasjonene med elektrisk luftfart vil være annerledes fra dagens operasjoner?	Pilotens refleksjoner rundt de største forskjellene på dagens luftfart og elektrisk luftfart
Hvilke likheter og forskjeller tror du dagens luftfartsorganisasjoner har med fremtidige organisasjoner som driver elektrisk luftfart?	Pilotens refleksjoner rundt forskjellene i organisasjonene som driver med luftfart nå og i fremtiden
Hva tror du er de største utfordringene med overgangen til elektrisk luftfart?	Pilotens refleksjoner rundt utfordringer ved overgangsprosessen til elektrisk luftfart
Hvilke momenter ville du vektlagt i overgangsfasen til elektrisk luftfart hvis du ledet endringen?	Hva anser piloten som viktige ivaretakelser i overgangsfasen
Hvordan vil du definere når overgangsfasen er komplett?	Pilotens forslag til kriterium for endt endringsprosess
Basert på refleksjonene i vår samtale: hva tror du er en realistisk tidshorisont på gjennomføringen av omstillingsprosessen fra luftfarten slik vi kjenner den idag til elektrisk- eller nullutslippsluftfart?	Pilotens refleksjon rundt tiden omstillingsprosessen vil ta

Appendix C: Coding tree



Appendix D: Request to partake in research project

Vil du delta i forskningsprosjekt om omstillingsprosessen for å gjøre luftfarten utslippsfri?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor målet er å få større kunnskap om omstillingsprosesser i luftfarten, med spesielt fokus på omstillingen til utslippsfri luftfart i Norge.

Prosjektet er en masteroppgave i Luftfartsvitenskap (FLY-3930) ved UiT Norges Arktiske Universitet, og gjennomføres av student Stener Berg Nelson (tidl flyger i SAS) under veiledning av Associate Professor Dr. John Ash.

Studien er interessert i dine perspektiver som flyger, og ønsket er å gjennomføre et intervju. Dette vil bestå av ca 10 spørsmål og er beregnet til å ta omtrent en times tid. Spørsmålene vil dreie seg om endringsledelse og omstillingsprosesser med fokus på operative forutsetninger og potensielle utfordringer ved omstillingen til utslippsfri luftfart. Deltakelsen krever ingen spesielle forkunnskaper, annet enn at du er operativ flyger.

Dine personopplysninger vil behandles i tråd med NSD/ Sikt sine retningslinjer om behandling og lagring av forskningsdata, og din deltakelse vil være anonymisert.

Trykk her dersom du ønsker å registrere din interesse for å delta i prosjektet. Det er ingen forpliktelser ved å melde interesse.

Dersom du er interessert så vil jeg kontakte deg med mer informasjon om prosjektet, samt samtykkeerklæring for deltakelse. Det vil også her være mer informasjon om personvern og databehandling.

Denne oppgaven er ikke utarbeidet i samarbeid med Widerøe. Den vil ikke omhandle Widerøes omstilling til utslippsfri luftfart spesielt, men tematikken rundt luftfartens omstilling generelt.

Ved spørsmål ikke nøl med å kontakte meg på mail sne014@uit.no eller telefon 91525333

Med vennlig hilsen

Stener Berg Nelson

Student, Master i Luftfartsvitenskap

Appendix E: Consent form

Vil du delta i forskningsprosjekt om omstillingsprosessen for å gjøre luftfarten utslippsfri?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor målet er å få større kunnskap om omstillingsprosesser i luftfarten, med spesielt fokus på omstillingen til utslippsfri luftfart i Norge. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål
Prosjektet er en masteroppgave i Luftfartsvitenskap (FLY-3930) ved UiT Norges Arktiske Universitet. Tema er endringsledelse og omstillingsprosesser, og spesielt hvordan luftfarten skal gjennomføre omstillingsprosessen til å bli utslippsfri og hvordan denne omstillingen kan ledes.

Hvem er ansvarlig for forskningsprosjektet?
Institutt for teknologi og sikkerhet ved UiT Norges arktiske universitet er ansvarlig for prosjektet. Oppgavens veileder er tilknyttet Universitetet i Cambridge.

Hvorfor får du spørsmål om å delta?
Du får denne forespørselen fordi du er ansatt i Widerøe og har respondert positivt på spørreskjema utsendt med informasjon og forespørsel om deltakelse i forskningsprosjektet.

Hva innebærer det for deg å delta?
Studien er interessert i dine perspektiver som flyger, og ønsket er å gjennomføre et intervju. Dette vil bestå av ca 10 spørsmål og er beregnet til å ta omtrent en times tid. Spørsmålene vil dreie seg om endringsledelse og omstillingsprosesser med fokus på operative forutsetninger og potensielle utfordringer ved omstillingen til utslippsfri luftfart. Deltakelsen krever ingen spesielle forkunnskaper, annet enn at du er operativ flyger.

Dersom intervjuet avholdes fysisk vil det gjøres lydopptak og notater av dette. Dersom det avholdes på digital flate vil det i tillegg kunne bli aktuelt med videoopptak.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger
Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket. Det er kun student og veileder som vil ha tilgang til personopplysningene. Personopplysninger som navn, kontaktinformasjon ol. vil ikke være relevant for studien annet enn i kontakt mellom student og informant.

Demografisk informasjon som alder, kjønn, stillingstittel og erfaring vil kunne bli del av studien for å gi innsikt i studiens helhetlige informantutvalg. Du vil ikke kunne identifiseres basert på opplysningene du leverer.

Hva skjer med personopplysningene dine når forskningsprosjektet avsluttes?
Prosjektet vil etter planen avsluttes 31.08.2023. Alle opptak av video eller lyd samt transkriberinger vil slettes etter prosjektets slutt.

Hva gir oss rett til å behandle personopplysninger om deg?
Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra UiT Norges arktiske universitet har Sikt – Kunnskapssektorens tjenesteleverandør vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke opplysninger vi behandler om deg, og å få utlevert en kopi av opplysningene
- å få rettet opplysninger om deg som er feil eller misvisende
- å få slettet personopplysninger om deg
- å sende klage til Datatilsynet om behandlingen av dine personopplysninger

Hvis du har spørsmål til studien, eller ønsker å vite mer om eller benytte deg av dine rettigheter, ta kontakt med:

- Institutt for teknologi og sikkerhet ved UiT Norges arktiske universitet ved Associate Professo Dr John Ash på jsa1003@cam.ac.uk
- Vårt personvernombud: Sølvi Brendeford Anderssen på personvernombud@uit.no

Hvis du har spørsmål knyttet til vurderingen som er gjort av personverntjenestene fra Sikt, kan du ta kontakt via:

- Epost: personverntjenester@sikt.no eller telefon: 73 98 40 40.

Med vennlig hilsen

John Ash
Lieutenant Commander BA MPhil PhD Royal Navy (ret.)
Associate Professor, UiT the Arctic University of Norway

Stener Berg Nelson
Student

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet *omstillingsprosessen for å gjøre luftfarten utslippsfri* og har fått anledning til å stille spørsmål. Jeg samtykker til:

☐ å delta i intervju

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet

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(Signert av prosjektdeltaker, dato)